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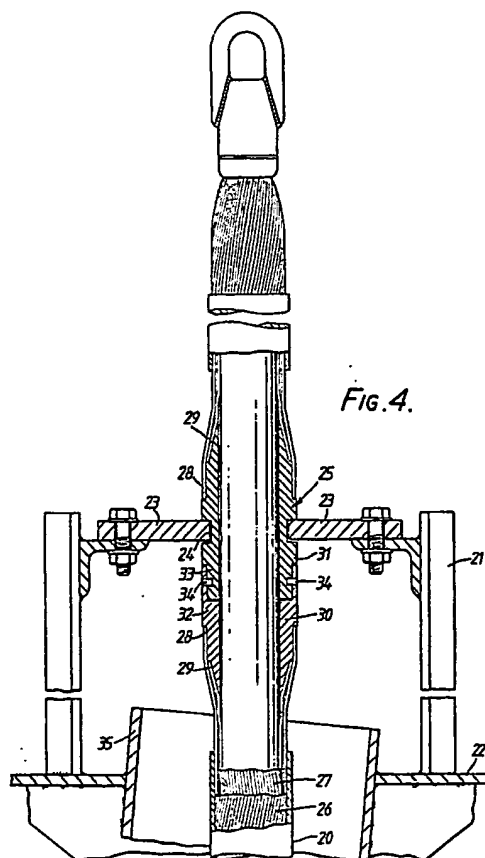
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(58) Field of search

H2C  
F2P  
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D1T  
Selected US specifications from IPC sub-classes H02G  
F16L

## (54) Armoured cables

(57) An armoured submarine cable has a support collar 25 spaced from one end thereof and is secured to the armouring 26, 27 of the cable on each side of the collar. The collar has an annular groove 24 which includes a radial shoulder 24 which is downwardly facing when the cable adjacent the collar is disposed substantially vertically and which locates on flanges 23 of a support structure 21 in order to support a depending length 20 of the cable. If the cable is hooked by an anchor or trawl the dowels 34 shear so that excessive loads are not transmitted to the platform. The cable may be a power cable comprising one or more electric conductors, a telecommunications cable comprising wires and/or optical fibres or a hydraulic umbilical.

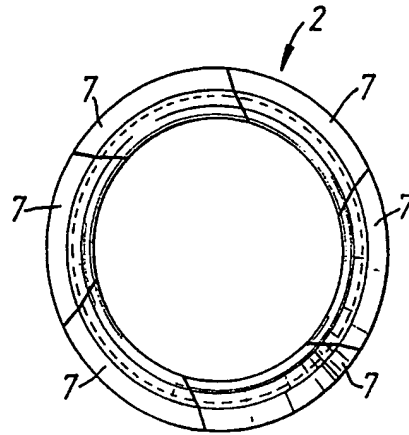
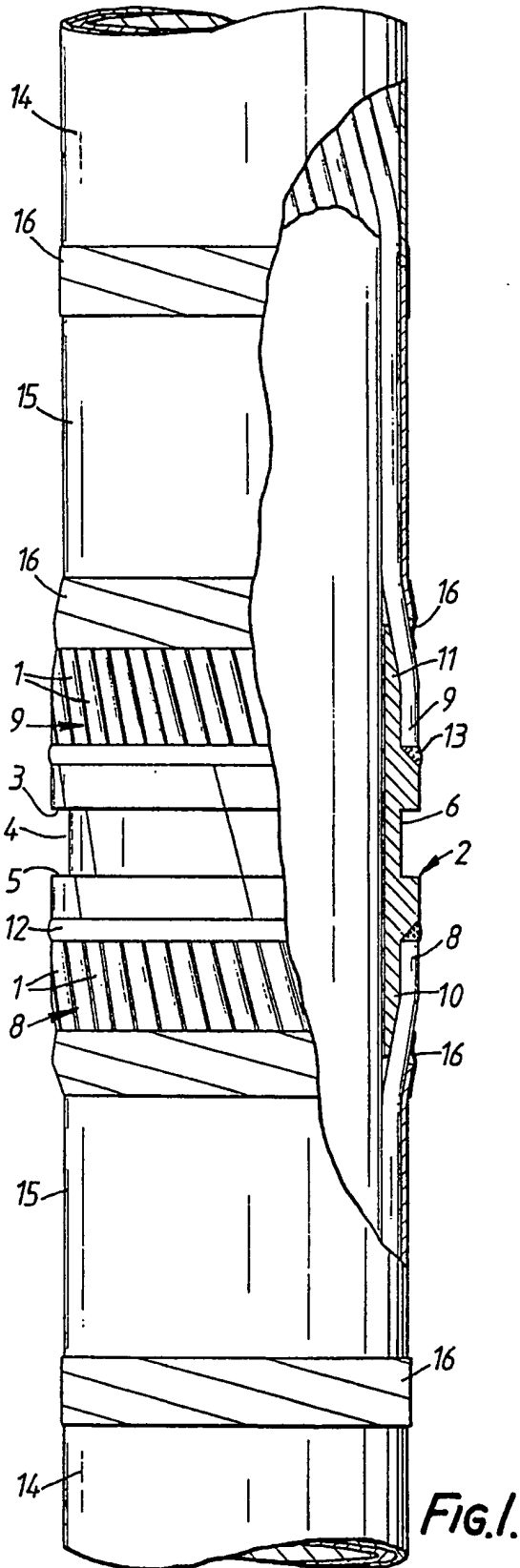


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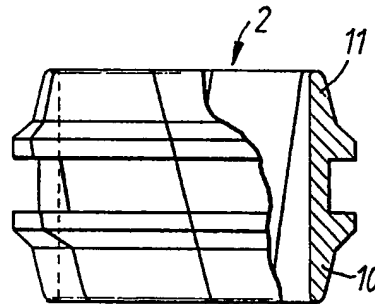
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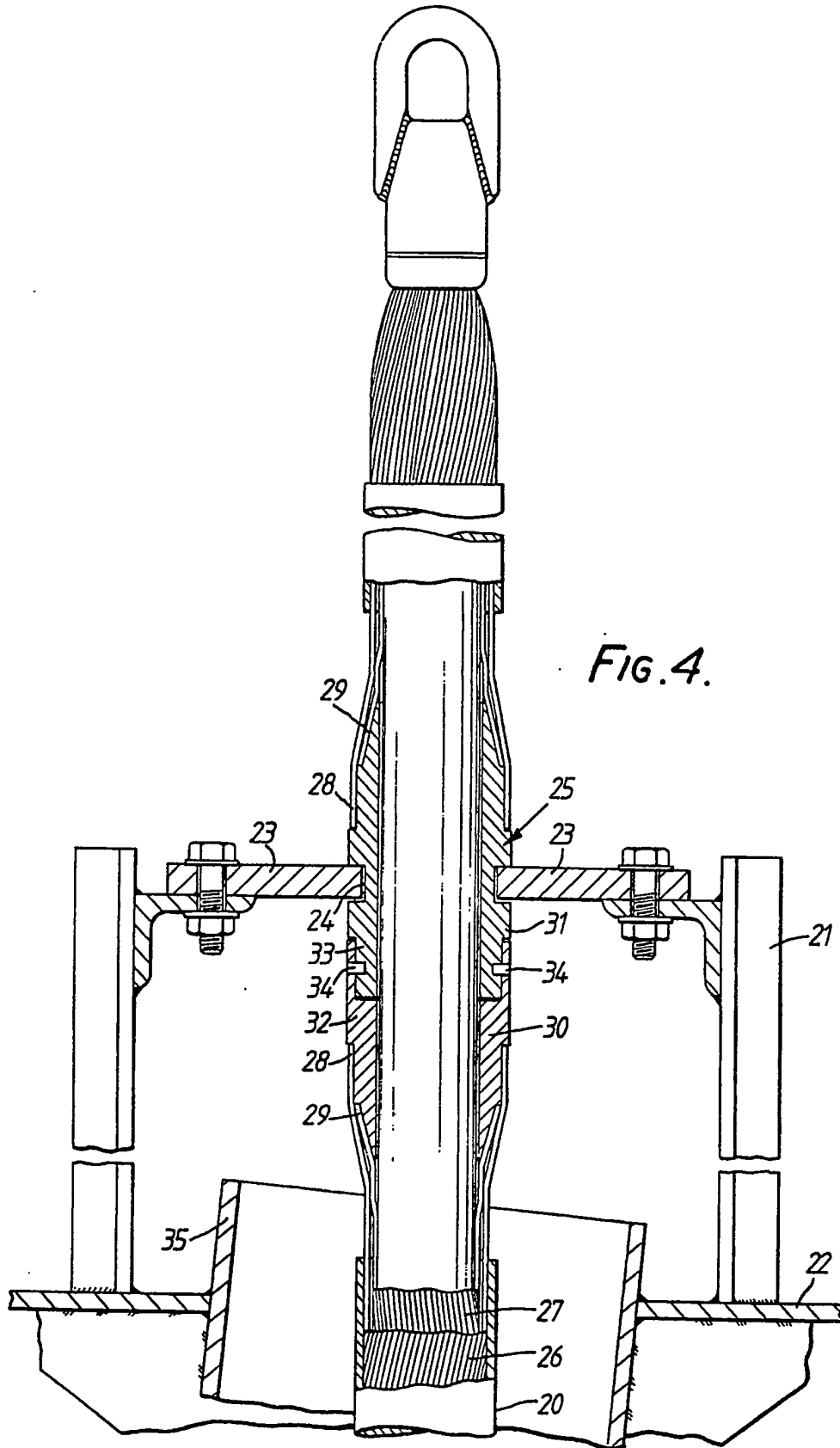
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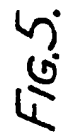


*Fig. 2.*



*Fig. 3.*





## SPECIFICATION

**Armoured cables**

5 This invention relates to armoured cables, for example armoured electric power cables which comprise one or more electric conductors, armoured telecommunication cables which comprise telecommunication transmission elements such as  
 10 wires and/or optical fibres, and armoured hydraulic cables which comprise one or more hydraulic conduits and are sometimes referred to as hydraulic umbilicals.

In one aspect the invention is concerned with enabling a depending length of an armoured cable to be supported, for example, from an offshore platform.

In this aspect the invention provides an armoured cable having spaced from one end thereof a support collar which is secured to the armouring of the cable on each side of the collar, said collar having a radial shoulder arranged to be downwardly facing when the cable adjacent the collar is disposed substantially vertically with said one end uppermost to enable a  
 20 depending length of the cable adjacent the collar to be supported thereby. As will be appreciated the downwardly facing shoulder need only be located on a fixed support in order to support the depending length of cable.

Preferably the collar has a radially outwardly opening annular groove defined between said shoulder and a radial shoulder opposite thereto. The provision of such a groove enables the collar to be located against upward and sideways movement relative to  
 30 a fixed support engaged with the groove.

Whilst the collar may be fitted over the armouring of the cable, preferably an annular section of said armouring is removed from said cable at the location of the collar and the thus formed free ends of the  
 40 armouring are secured to opposed end portions of the collar. Also, preferably the thus formed free ends of the armouring are disposed over the end portions of the collar.

The collar may be split lengthwise to assist fitting and preferably is obliquely axially split into a plurality of segments - for example six - to facilitate bending of the cable.

Advantageously, the collar is split into two longitudinal parts which are interconnected by fastening means adapted to shear when the collar is subjected to a predetermined tensile load.

In another aspect of the invention there is provided an armoured cable wherein an annular section of the armouring thereof is removed from the cable and the  
 55 thus formed free ends of the armouring are secured to opposed ends of a collar, said collar being split into two longitudinal parts which parts are interconnected by fastening means adapted to shear when the collar is subjected to a predetermined tensile load. Such a collar can be disposed anywhere  
 60 along the length of the cable.

In order that the invention may be well understood, some embodiments thereof, which are given by way of example only, will now be described with  
 65 reference to the accompanying drawings, in which:

*Figure 1* is a part-sectional side view of a section of an armoured submarine power cable;

*Figure 2* is an end view of a collar of the power cable of *Figure 1*;

70 *Figure 3* is a part-sectional side view of the same collar;

*Figure 4* is a part-sectional side view of an end section of another armoured submarine power cable secured to a platform support with a length of the  
 75 cable depending therefrom; and

*Figure 5* is a part-sectional side view of another armoured submarine cable.

Referring first to *Figure 1*, there is shown a section of an armoured cable adjacent one end thereof (not shown). The armouring of the cable illustrated comprises a single layer of armour wires 1. A support collar 2, formed for example of steel, is spaced from the end of the cable and secured to the armouring on each side of the collar 2. The collar has a radial shoulder 3 arranged to be downwardly facing when the cable adjacent the collar is disposed vertically, as shown, or substantially vertically, with the end of the cable closest to the collar uppermost to enable a depending length of cable adjacent the collar to be supported thereby on a fixed support engaged by the shoulder. In order to enable the cable to be more positively supported by the collar, the collar in the arrangement shown in *Figure 1* has a radially outwardly opening annular groove 4 defined between  
 95 the radial shoulder 3 and a radial shoulder 5 opposite thereto and having a base 6. By locating cooperating flanges of a support structure in the groove 4 the collar can be clamped in fixed relationship to the support structure, or at least more positively located relative thereto, as will be more apparent hereinafter when the same feature is described in connection with the cable shown in *Figure 4*.

As will be clearer from *Figures 2* and *3*, the collar 2 of the cable shown in *Figure 1* is split lengthwise to enable it to be fitted about the cable. As shown the collar 2 is obliquely axially split into a plurality of segments 7 with a small gap between adjacent segments, six such segments being used in this particular embodiment. The direction and angle of the splits in the collar corresponds to that of the lay of the armour wires 1 to facilitate bending of the section of the cable which includes the collar.

To fit the collar 2, an annular section of the armouring is removed from the cable at the location of the collar and the thus formed free ends 8,9 of the armouring are secured to opposed end portions 10,11 of the collar. As will be appreciated the collar provides mechanical protection for the cable in place of the removed section of armouring and also provides a tensile connection between the armouring on each side of the collar. In the illustrated arrangement, the ends 8,9 of the armouring are disposed over the end portions 10,11 of the collar and fixed to the collar by welds 12,13 which secure the ends of the individual  
 125 armour wires to the collar. The end portions 10,11 have tapers on their external surfaces such that the outer contour of the cable is devoid of abrupt changes at their locations. In the fitting of the collar, a layer of serving 14, provided over the armouring will  
 130 have been removed over a length greater than the

length of the collar. After welding of the armour wires to the collar has been completed, fresh serving 15 is applied to the armouring and secured by taping 16.

Referring now to Figure 4, an end section of another submarine power cable is illustrated with a depending length 20 thereof being supported by a fixed support structure 21 on an off-shore platform 22 which includes split flanges 23 which are received in an annular groove 24 of a support collar 25 of the

10 cable.  
The collar 25 and the manner in which it is incorporated in the cable shown in Figure 4 are generally similar to the collar 2 and the manner in which it is incorporated in the cable shown in Figure 1 as will be apparent from a comparison of these Figures. However, it will be noted that the armouring of the cable shown in Figure 4 comprises two layers 26, 27 of armour wires and that the free ends of these layers are welded in staggered relationship to the respective end portions 28, 29 of the collar after annular sections of the layers 26, 27 have been removed from the cable at the location of the collar.

Additionally, it will be noted that the collar 25 is split into two longitudinal parts 30, 31. Part 30 is formed with a socket end portion 32 into which a spigot end portion 33 of part 31 fits and the socket and spigot end portions are interconnected by fastening means, shown as radially disposed dowels 34, which are adapted to shear when the collar is subjected to a predetermined tensile load for example in the range of 10 to 15 Tonnes. This feature prevents excessive loads being transferred to the platform should the submarine cable be hooked by an anchor or trawl.

It will also be noted that the end of the cable is fitted with a pulling eye which enable the cable to be pulled from the sea bed through a caisson (the top of which is illustrated at 35 in Figure 4) and by which the cable can be supported whilst the split flanges 23 of the support structure 21 on the platform 22 are being located in the groove 24 of the collar 25 in order to support the depending length 20 of the cable.

The provision of the collar 2, 25 in the illustrated cables does not substantially increase the outer diameter of the cables at their locations nor the flexibility thereat and accordingly will not greatly hamper installation of the cable. Thus, for example, the cable with the collar already fitted can be readily pulled through the caisson 35. A sleeve may be provided over the collar and cable adjacent thereto to provide an even smoother outer contour for the cable at the location of the collar if desired.

It will therefore be appreciated that the collar can be incorporated in the cable in the factory, or in any event prior to installation off-shore, in order to reduce the number of operations required on the cable off-shore.

The armoured cable shown in Figure 5 has an annular section of its armouring removed and the thus formed free ends of the armouring are secured to opposed end portions 36, 37 of a collar 38. The collar 38 like the collar 25 is split into two longitudinal parts 39, 40 which are interconnected by fastening means adapted to shear when the collar is subjected to a predetermined tensile load. As with collar 25, the

parts 39, 40 of collar 38 have cooperating socket and spigot end portions 41, 42 which fit together and the fastening means interconnect these portions and comprise radially disposed dowels 43. It will also be noted that the armouring of the cable shown in Figure 5 comprises two layers 44, 45 of armour wires like the cable of Figure 4 and that with the exception of the omission of the annular groove 24 present in collar 25 the collar 38 and the manner in which it is secured to the armouring is the same as that of the collar 25. One or more rubber or elastomeric sleeves 46 which may be heatshrink sleeves, may be provided over the collar and adjacent cable.

The collar 38 does not function to enable a depending length of cable to be supported, but instead can be incorporated anywhere in the cable where it is desired to prevent excessive tensile loads being transmitted by the armouring. Of course, the collar 38 may be incorporated in a cable which is also provided with a collar 25 and accordingly the cable sections shown in Figures 4 and 5 may be sections of the same cable.

In connection with the arrangements shown in Figures 4 and 5, it is to be understood that for the purposes of installation when the cables are likely to experience greater tensile loads than can be withstood by the dowels 34 and 43, dowels, or other fastening means, of greater shear strength may be used to interconnect the collar parts.

## 95 CLAIMS

1. An armoured cable having spaced from one end thereof a support collar which is secured to the armouring of the cable on each side of the collar, said collar having a radial shoulder arranged to be downwardly facing when the cable adjacent the collar is disposed substantially vertically with said one end uppermost to enable a depending length of the cable adjacent the collar to be supported thereby.

2. A cable as claimed in claim 1, wherein said collar has a radially outwardly opening annular groove defined between said shoulder and radial shoulder opposite thereto.

3. A cable as claimed in claim 1 or 2, wherein an annular section of said armouring is removed from said cable at the location of the collar and the thus formed free ends of the armouring are secured to opposed end portions of the collar.

4. A cable as claimed in claim 3, wherein said thus formed free ends of the armouring are disposed over the end portions of the collar.

5. A cable as claimed in any one of the preceding claims, wherein said collar is split lengthwise.

6. A cable as claimed in claim 5, wherein the collar is obliquely axially split into a plurality of segments.

7. A cable as claimed in claim 6, wherein the collar is split into six segments.

8. A cable as claimed in any one of the preceding claims, wherein the collar is split into two longitudinal parts which are interconnected by fastening means adapted to shear when the collar is subjected to a predetermined tensile load.

9. An armoured cable wherein an annular section

of the armouring thereof is removed from the cable and the thus formed free ends of the armouring are secured to opposed ends of a collar, said collar being split into two longitudinal parts which parts are inter-  
5 connected by fastening means adapted to shear when the collar is subjected to a predetermined tensile load.

10 10. A cable as claimed in any one of the preceding claims, wherein the cable comprises one or more electric conductors.

11. A cable as claimed in anyone of claims 1 to 9, wherein said cable comprises telecommunication elements.

15 12. A cable as claimed in any one of claims 1 to 9, wherein said cable comprises one or more hydraulic conduits.

13. An armoured cable substantially as herein described with reference to Figures 1 to 3, 4 or 5 of the accompanying drawings.

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Prior Applications: 0402206.7 filed in United Kingdom on 2 February 2004

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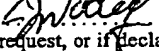
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This declaration is directed to international application No. PCT/..... (if furnishing declaration pursuant to Rule 26ter).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

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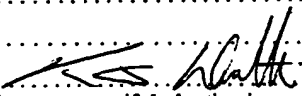
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Citizenship: British

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